

AoFrio

USER MANUAL

SCS controller - Variable Speed Control for fans

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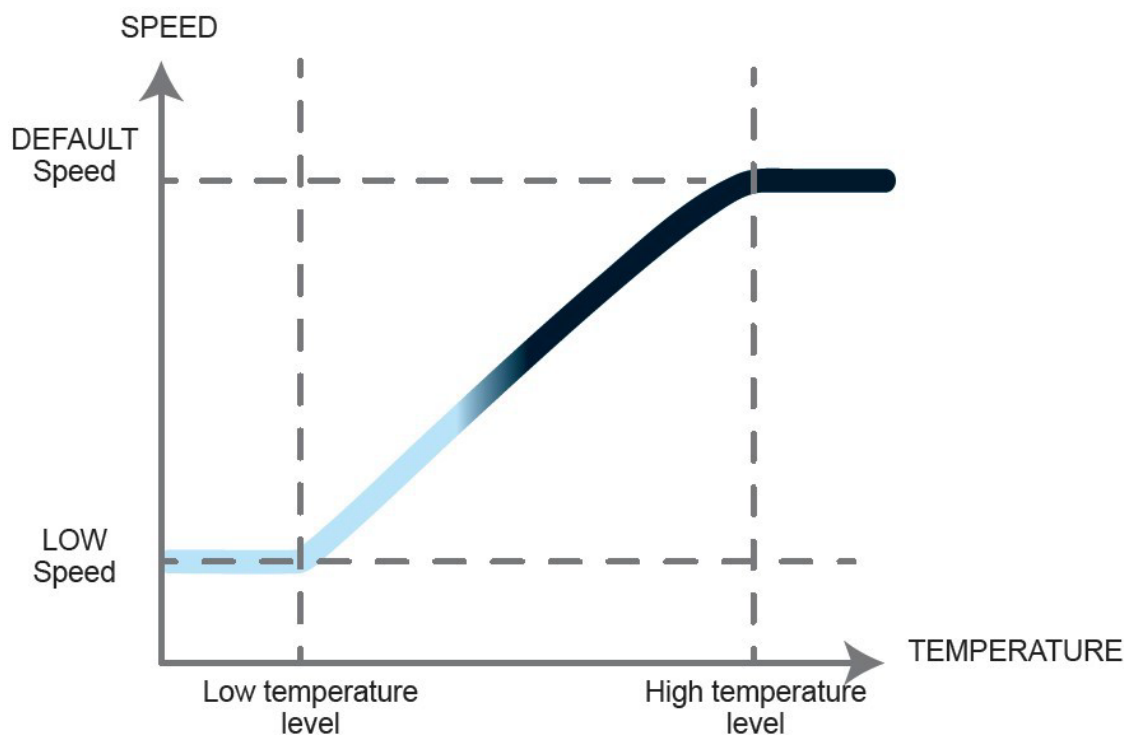
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Speed control

Temperature based variable speed control of the Evaporator and Condenser Fans is based on a lower and upper temperature points and lower and upper speed points.

Speed then varies linearly between the two speed/temp points as temperature changes. For the Evaporator, temperature is based on the return-air temperature. For the Condenser, it is based on the condenser temperature.



Normal - Adv (nrL)

Evaporator

Parameter name	Digital display	Increments & units	Range	Default
Evaporator Fan Control - Normal Mode	FCn	integers	0 - 6	0
Evaporator Fan Setpoint - Normal Mode	FSP	0.1 °C	-10 to 15 °C	3.5 °C

Duty parameters

'Duty parameters' are sometimes mentioned in this document. These parameters are used by the SCS Controller when the evaporator fan is cycling on/off, and when the compressor is not running.

While in Normal Mode, "duty" is controlled by these parameters (in minutes).

- "Evaporator Fan on Time - Normal Mode"
- "Evaporator Fan off Time - Normal Mode"

The actual value of duty will be "On Time" / ("Off Time" + "On Time")

There are an additional pair of parameters that control this behaviour for Standby Mode.



Evaporator Fan Control - Normal Mode (FCn)

Selects how the Evaporator Fan is controlled in Normal Mode:

- 0 = Evaporator Fan is on at DEFAULT speed when the Compressor is also on. When the Compressor is off it cycles at DEFAULT speed with the duty parameters.
- 1 = Evaporator Fan is on at DEFAULT speed when the Compressor is also on. When the Compressor is off it cycles at LOW speed with the duty parameters.
- 2 = Evaporator Fan is on at DEFAULT speed depending on the Return Air temperature. This is independent of the Compressor state.
- 3 = Evaporator Fan is on at DEFAULT speed depending on the Return Air temperature when the Compressor is on. When the Compressor is off it cycles with the duty parameters at DEFAULT speed.
- 4 = Evaporator fan speed is linearly controlled from Low Speed at the current modes setpoint to Default Speed at Variable-Evap-Fan-Temp-Range ABOVE the current modes setpoint.
- 5 = The Evaporator fan is on at default speed when compressor is on and is on at low speed when compressor is off
- 6 = The Evaporator fan speed is linearly controlled from Low Speed at the current modes setpoint to Default Speed at Variable Evaporator Fan Temp Range ABOVE the current modes setpoint When the Compressor is running. When the Compressor is off then the fan will cycle at low speed.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
FCn	Evaporator	0-6	integers	0	SP, dlt, SSP

Evaporator Fan Set Point (°C) (FSP)

The Set Point Temperature when the Evaporator Fan is in Temperature Control Mode. This is used for ON/OFF fan control based on the return-air temperature rather than compressor cycles or a fixed duty cycle. The differential is defined by Evaporator Fan Temperature Range (Etr).

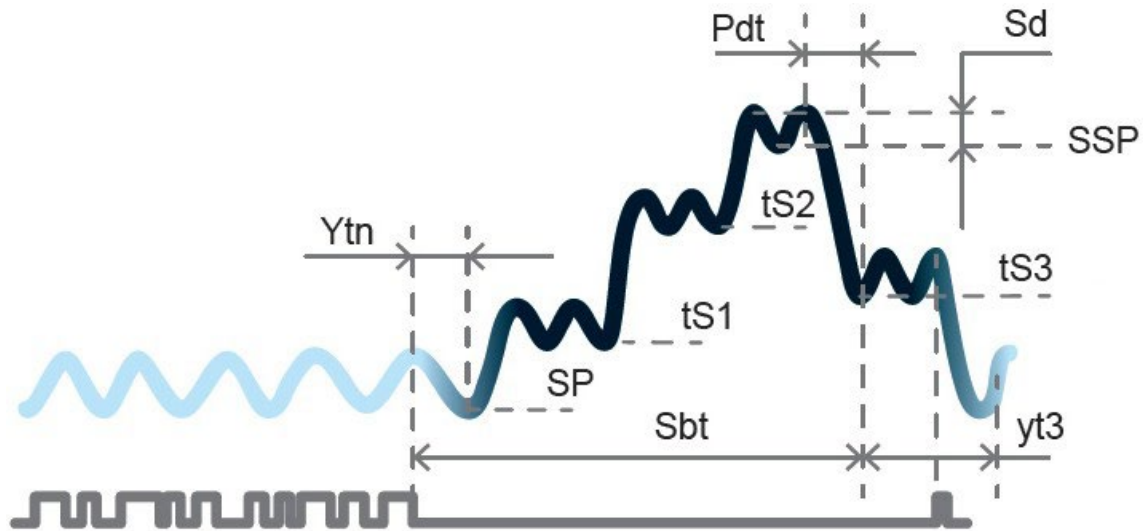
Note: This function is only used when the Evaporator Fan is set to temperature control in the FCn Menu (2 or 3).

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
FSP	Evaporator	-10.0 to 15.0 °C	0.1 °C	3.5 °C	Etr, FCn

Standby - Adv

The Standby Modes are an intelligent method to save power when the Coolers are not being accessed by customers, generally outside of normal business hours.

The SCS can manage this process to minimize the Pulldown time when businesses re-open, or it can maximize energy savings overall.



Standby - Adv (SdY)

Evaporator

Parameter name	Digital display	Increments & units	Range	Default
Evaporator Fan Control - Standby	Fby	integers	0 - 2	2
Evaporator On Time - Standby	Fts	1min	0 - 30min	2min
Evaporator Off Time - Standby	Fos	1min	0 - 30min	2min



Evaporator Fan Control - Standby Mode (Fby)

This configures how the Evaporator Fan is controlled when the SCS controller is in Standby Mode:

- 0 = Evaporator Fan is on at LOW speed when the Compressor is on. When the Compressor is off it cycles with the NORMAL MODE duty parameters at LOW speed.
- 1 = Evaporator Fan is on at LOW speed when the Compressor is on. When the Compressor is off it cycles with the STANDBY duty parameters at LOW speed.
- 2 = Follows ALL Normal Mode settings and parameters.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
Fby	Evaporator	0-2	integers	2	SSP, FtS

Evaporator Fan On Time - Standby Mode (FtS)

The length of time the Evaporator Fan is on when the Compressor is off during full Standby Mode.

- 0 = Evaporator Fan is always off.

The total Evaporator Fan cycle = the on time + the off time. Please also refer to FoS. Note that this is only active when Fby = 1.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
FtS	Evaporator	0 to 30mins	1min	2min	FoS

Evaporator Fan Off Time - Standby Mode (FoS)

The length of time the Evaporator Fan is off when the Compressor is off during full Standby Mode.

- 0 = Evaporator Fan is always on.

Please note: The total Evaporator Fan cycle = the on time + the off time. Please also refer to FtS. Note that this is only active when Fby = 1.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
FoS	Evaporator	0 to 30mins	1min	2mins	FtS



Door – Adv (dor)

The SCS Connect uses the cabinet door switch as an input device to help control the Evaporator Fan, Lights and to initiate Alarms. Please note: Should the door switch fail, these parameters will not function correctly.

Evaporator

Parameter name	Digital display	Increments & units	Range	Default
Evaporator Fan Control when Cabinet Door Open	Fdo	integers	0-3	0

Evaporator Fan Control When Cabinet Door Open (Fdo)

Selects how the Evaporator Fan is controlled when the door is open. This is to allow the fan to continuously run, which can be beneficial by maintaining an air curtain.

- 0 = Evaporator Fan is turned off while the door is open.
- 1 = Evaporator Fan is turned on at DEFAULT speed while the door is open.
- 2 = Evaporator Fan is turned on at LOW speed while the door is open.
- 3 = Evaporator Fan is controlled as if the door was not open.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
Fdo	Evaporator	0 to 3	integer	0	Fby, FCn



Variable Speeds - Adv

The Variable Speed settings are used to set different speeds when running in variable speed mode. If the evaporator and Condenser fan are both set to on/off mode, these parameters have no effect.

Parameter name	Digital display	Increments & Units	Range	Default
Condenser Fan Control	CFC	integers	0-1,2*	0

Temperature

Parameter name	Digital display	Increments & Units	Range	Default
Evap Fan Temperature Range	Etr	0.1 °C	0.1 to 30.0 °C	5.0 °C
Variable Cond Fan Temp Upper	Ctu	1 °C	30 to 150 °C	55 °C
Variable Cond Fan Temp Lower	CtL	1 °C	30 to 150 °C	30 °C

Speed

Parameter name	Digital display	Increments & Units	Range	Default
Variable Evap Fan Speed - Default	ESd	10rpm	500 to 2300	1800 rpm
Variable Evap Fan Speed - Low	ESL	10rpm	500 to 2300	1300 rpm
Variable Cond Fan Speed - Default	CSd	10rpm	500 to 2300	1800 rpm
Variable Cond Fan Speed - Low	CSL	10rpm	500 to 2300	1300 rpm

Time

Parameter name	Digital display	Increments & Units	Range	Default
Variable Cond Fan Reverse Time	CRT	1 min	0 to 15	0 mins

*FW Version 4010 and above



Condenser Fan Control (CFC)

This configures how the Condenser Fan is controlled when in variable speed mode

- 0 = Condenser Fan is ON at DEFAULT speed when the compressor is on, and OFF when the Compressor is off.
- 1 = Condenser Fan runs linearly from “Variable Cond Fan Speed - Low” when the condenser temp is at “Variable Cond Fan Min Temp” to Variable Cond Fan Speed - Default” when condenser temp is at “Variable Cond Fan Max Temp”.
- 2 = When the Compressor is ON it operates as per CONDENSER FAN CONTROL = 1. When the Compressor is OFF, the Condenser Fan is OFF.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
CFC	Control	0-1,2*	integers	0	

Evap Fan Temperature Range (Etr)

The temperature differential above setpoint at which the Evap fan runs continuously at default speed when being controlled based on return-air-temp.

When FCn = 4 - The temperature above the CURRENT MODE SETPOINT, at which the evap fan will run at the Variable Evap Fan Speed - Default. Speed increases linearly with temperature from Variable Evap Fan Speed - Low when control temperature equals setpoint temperature.

When FCn = 2 or 3 - The temperature differential above the EVAPORATOR FAN SET POINT (FSP). The evaporator fan is ON when above this temperature, and OFF when below FSP.

Please refer to FCn for further details.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
Etr	Temperature	0.1 to 30.0 °C	0.1 °C	5.0 °C	FCn

Variable Cond Fan Temp Upper (Ctu)

The Condenser Temp above which the Condenser Fan will run at DEFAULT speed.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
Ctu	Temperature	30 to 150 °C	1 °C	55 °C	

Variable Cond Fan Temp Lower (CtL)

The Condenser Temp below which the Condenser Fan will run at LOW speed.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
CtL	Temperature	30 to 150 °C	1 °C	30 °C	

*FW Version 4010 and above



Variable Evap Fan Speed - Default (ESd)

The speed used for all basic evaporator fan operation when using a speed-controlled motor. If a non-speed-controlled motor is being used, this parameter is ignored.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
ESd	Speed	500 to 2300rpm	10 rpm	1800 rpm	

Variable Evap Fan Speed - Low (ESl)

The speed used as the evaporator fan slower speed if required based on configuration.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
ESL	Speed	500 to 2300rpm	10 rpm	1300 rpm	

Variable Cond Fan Speed - Default (CSd)

The speed used for all basic condenser fan operation.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
CSd	Speed	500 to 2300rpm	10 rpm	1800 rpm	

Variable Cond Fan Speed - Low (CSl)

The speed used as the condenser fan slower speed if required based on configuration.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
CSL	Speed	500 to 2300rpm	10 rpm	1300 rpm	

Variable Cond Fan Reverse Time (Crt)

The time which the condenser fan will run in reverse at the low speed, before stopping, after the compressor has just been turned off. Only active with a speed controlled motor. If a non-speed controlled motor is being used, this parameter is ignored.

Digital display	Functional category	Parameter range	Increments & units	Default	Related menus
Crt	Time	0 to 15 mins	1 min	0 mins	

Worked example

In this example, these are the parameters we have used:

Parameter	Value
Evaporator Fan Control – Normal	4
Evaporator Fan Control Type	Var
Variable Evap Fan Speed – Default	1800 rpm
Variable Evap Fan Speed – Low	1000 rpm
Variable Evap Fan Temp Range	5 °C
Set Point	3 °C

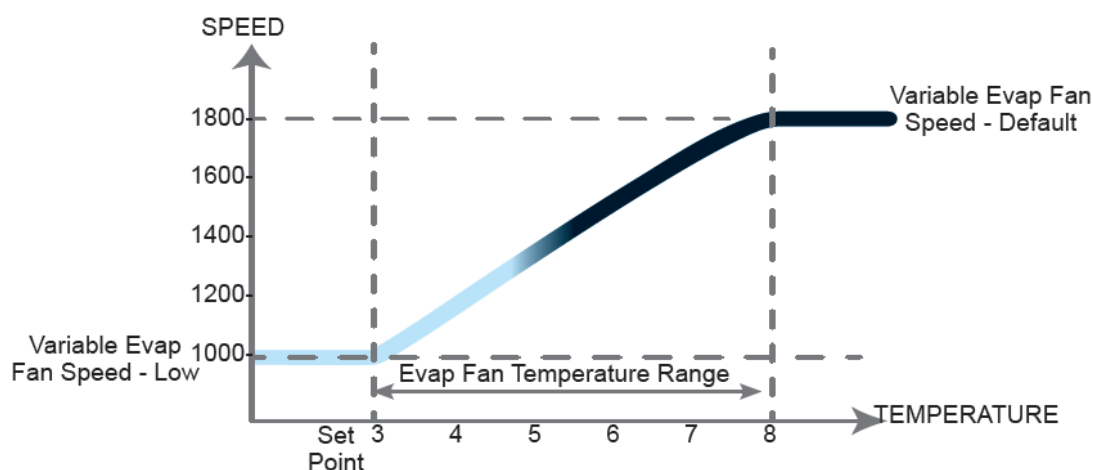
Setpoint + Variable Evap Fan Temperature Range = 8 °C (3 °C + 5 °C).

When the return-air-temperature is above 8 °C the fan will run at the Variable Evap Fan Speed – Default. In this example it is 1800rpm.

As the return-air-temperature reduces below 8 °C, the controller will begin to slow the evaporator fan speed.

The speed will decrease linearly below 8 °C until the setpoint is reached at 3 °C.

At 3 °C the evaporator fan will run at Variable Evap Fan Speed – Low, which is 1000rpm.



The speeds that the fan will run at for each temperature are therefore as follows:

Temperature (°C)	1	2	3	4	5	6	7	8	9	10
Speed (rpm)	1000	1000	1000	1160	1320	1480	1640	1800	1800	1800

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